

SL1 Mid-Year Final – Paper 2

Name _____

1. The relative molecular mass of aluminum chloride is 267 and its composition by mass is 20.3% Al and 79.7% chlorine. Determine the empirical and molecular formulas of aluminum chloride.

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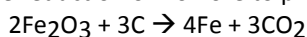
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(Total 4 marks)

2. The reaction below represents the reduction of iron ore to produce iron.



A mixture of 30 kg of Fe_2O_3 and 5.0 kg of C was heated until no further reaction occurred.

Calculate the maximum mass of iron that can be obtained from these masses of reactants.

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(Total 5 marks)

3. State the type of bonding in the compound SiCl_4 . Draw the Lewis structure for this compound.

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(Total 3 marks)

4. Draw the Lewis structure of NCl_3 . Predict, giving a reason, the $\text{Cl} - \text{N} - \text{Cl}$ bond angle in NCl_3 .

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(Total 3 marks)

5. (a) (i) State the meaning of the term *electronegativity* and explain why the noble gases are not assigned electronegativity values.

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- (2) (ii) State and explain the trend in electronegativity across period 3 from Na to Cl.

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(2)

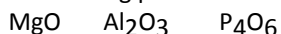
- (iii) Explain why Cl_2 rather than Br_2 would react more vigorously with a solution of I^- .

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(2)

- (b) State the acid-base properties of the following period 3 oxides.



Write equations to demonstrate the acid-base properties of each compound.

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(7)

(Total 13 marks)

6. State the electron arrangement for atoms of aluminum, nitrogen and fluorine.

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(Total 2 marks)

7. The element vanadium has two isotopes, $^{50}_{23}\text{V}$ and $^{51}_{23}\text{V}$, and a relative atomic mass of 50.94.

- (a) Define the term *isotope*.

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(1)

- (b) State the number of protons, electrons and neutrons in $^{50}_{23}\text{V}$.

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(2)

- (c) State and explain which is the more abundant isotope.

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(1)

- (d) State the name and the mass number of the isotope relative to which **all** atomic masses are measured.

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(1)

(Total 5 marks)

8. The element bromine exists as the isotopes ^{79}Br and ^{81}Br , and has a relative atomic mass of 79.90.

- (a) Complete the following table to show the numbers of sub-atomic particles in the species shown.

	an atom of ^{79}Br	an ion of $^{81}\text{Br}^-$
protons		
neutrons		
electrons		

(3)

- (b) State and explain which of the two isotopes ^{79}Br and ^{81}Br is more common in the element bromine.

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(1)

- (c) The element calcium is in the same period of the Periodic Table as bromine.

- (i) Write the electron arrangement for an atom of calcium.

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(1)

- (ii) Deduce the formula of the compound calcium bromide.

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(1)

(Total 6 marks)